

A study on Relationship between Total Asset Management (TAM) and Risk Management in infrastructure industry of Nagpur city

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Abstract:

The role of infrastructure factors in economic development is complex and indirect. The theories of economic development focus sufficient attention on this discussion. Hirschman's point of view was that enlarged availability of electric power and transportation facilities are essential preconditions for economic development practically everywhere and investments in essential overhead capital is advocated not because of its direct effect on final output, but because it permits, and in fact invites, direct productive activities to come in (Hirschman, 1958). In his theory of 'Stages of Growth', Rostow held similar views and considered social overhead capital, especially in transport and communication as one of the main pre-conditions for take off (Rostow, 1960). The role of social overhead capital in accelerating economic growth and in enhancing public welfare is more pronounced in developing economies as the indivisibility in the social overhead capital has been identified as one of the main obstacles of the development of under-developed countries (Rosenstein-Rodan, 1943)

This study was undertaken to find out relationship between Total Asset Management (TAM) and risk Management.

Keywords: Total Asset Management, Risk management, Nagpur and Infrastructure

Introduction:

Infrastructure development – Past versus Present

There has been a growing emphasis on infrastructure development in the post liberalisation era. This is in stark contrast to previous years where there was little emphasis on infrastructure asset creation, with government being both facilitator and provider of infrastructure. But this situation has undergone a change in recent years, with an increased focus on infrastructure development. The start of the last decade has witnessed increased investments in infrastructure sector, accompanied by a transformation in the business models with more proactive participation from private sector in the form of Public-Private-Partnership (PPP) projects, particularly in roads and power sector.

The Gross Capital Formation (GCF) (as an indicator of investment in infrastructure) grew from 5.6% of GDP in FY07 to 6.5% of GDP in FY12. Overall share of investment in infrastructure (as a share of GDP) over the XIth Plan period was 7.1%, up from 5% in Tenth Plan. The share of private sector participation in the XIth plan, envisaged at ~ 30% at the start of the plan, was ~ 37% during the Plan duration.

Risks / Current challenges in infrastructure development in India

But the progress of infrastructure development has not been smooth in the recent years, with significant shortfalls in planned investments. This problem is compounded by the fact that many of the announced projects are yet to be completed, with large time and cost overruns. Figures sourced from Government reports reveal that nearly 276 projects out of 566 projects tracked by Ministry of Statistics and Programme Implementation have been delayed. Some estimates of Ministry of Finance peg the worth of delayed projects, due to pending approvals, at ~ INR 1 lakh Crore.

(By Susnato Sen, Practice Head – Infrastructure and EPC, Tata Strategic Management Group (TSMG), Mittal Shah – Project Leader – Delivery Excellence & EPC, TSMG and Anirudh Reddy, Project Leader – TSMG.)

Some of the key issues plaguing the sector are:

1. Land acquisition and environmental clearance
2. Lack of coordination between various Government agencies
3. Inappropriate structuring of the projects, particularly of demarcation of risks and rewards between Government and private sector
4. Lack of a proper dispute resolution mechanism between private players and government agencies
5. Debt burden of infrastructure developers, as a consequence of execution delays and irrational bidding

A number of firms have had their debt recast by corporate debt restructuring cell, with some firms resorting to sale of BOT assets to reduce their debt burden, post award of the project. This has also delayed project implementation. The order inflows for large infrastructure firms have declined over the past 1-2 years. The appetite of infrastructure developers for new projects has significantly reduced. This has resulted in very lukewarm response to bids from the government agencies like NHA in the PPP route. Banks are also being cautious in lending to infrastructure sectors, where exposure limits have already been reached.

Importance & significance of study

World Development Report 1994 published by the World Bank under the title 'Infrastructure for Development' rightly mentions that the adequacy of infrastructure helps determine one country's success and another's failure in diversifying production, expanding trade, coping with population growth, reducing poverty or improving environmental conditions. Infrastructure provides people with the services they need and want. It is an input to production and raises the productivity of other factors. Infrastructure connects goods to the markets, workers to industry, people to services and the poor in rural areas to urban growth centres and lowers costs, enlarges markets and facilitates trade. Thus, infrastructure provides services that support economic growth by increasing the productivity of labour and capital thereby reducing the costs of production and raising profitability, production, income and employment.

A sound infrastructural foundation is the key to the overall socio-economic development of a

State. This acts as a magnet for attracting additional investment into a state and thus provides a competitive edge to it over other States. Availability of adequate and efficient infrastructural set up not only promotes rapid industrialization but also improves the quality of life of the people of the State.

Adequate infrastructure raises productivity and lowers production costs, but it has to expand fast enough to accommodate growth. While the precise linkages between infrastructure and development are yet to be firmly established, it is estimated that infrastructure capacity grows step for step with economic output-a one percent increase in the stock of infrastructure is associated with a one percent increase in GDP across all countries (Summers and Heston, 1991) As countries develop, infrastructure must adapt to support changing patterns of demand, as the shares of power, roads, and telecommunications in the total stock of infrastructure increase relative to those of such basic services as water and irrigation (Ingram and Fay, 1993)

Universe of the Study:

The universe of this study is all the infrastructure manufacturing companies from Nagpur city.

Respondents will be selected from the main stakeholders involved in large infrastructure projects in Nagpur, like general contractors, government agencies, consulting firms, and Infrastructure companies

Sampling technique: Simple Random sampling technique

Simple random sampling refers to a sampling method that has the following properties.

- The population consists of N objects.
- The sample consists of n objects.
- All possible samples of n objects are equally likely to occur.

An important benefit of simple random sampling is that it allows researchers to use statistical methods to analyze sample results. For example, given a simple random sample, researchers can use statistical methods to define a confidence interval around a sample mean. Statistical analysis is not appropriate when non-random sampling methods are used.

There are many ways to obtain a simple random sample. One way would be the lottery method. Each of the N population members is assigned a unique number. The numbers are placed in a bowl and thoroughly mixed. Then, a blind-folded researcher selects n numbers. Population members having the selected numbers are included in the sample.

Sample size:

General contractors	167
Engineering firms	72
Consulting firms	63
Government Agencies	47
Clients	23
Institutes	8
Suppliers	8
Total	388

Respondents profile:

A web-based survey tool, SurveyMonkey (<https://www.surveymonkey.com>), is employed in this survey to present the final questionnaire and collect and sort the data. It allows the researcher to conduct the survey with a low budget and tight schedule.

A computerized database of main industry players in Nagpur city was compiled from various sources. Identified industry practitioners are from the main stakeholders in the Nagpur infrastructure management sector, namely general contractors, sub-contractors, specialized contractors, suppliers, designing firms, clients, government agencies, consulting firms, academic institutions, etc., who are the key players in the infrastructure sector and have direct involvement in any given infrastructure project; either as decision-maker or implementer.

Respondents are from various types of organizations and have a good coverage of the main stakeholders in the infrastructure sector. Up to 42.9% of the respondents are from general contractors. Others are from engineering firms, consulting firms and governments agency (18.4%, 16.3% and 12.2%, respectively). There is a slight overlap between engineering firms and consulting firms, as some of the consulting firms provide engineering specialized services. Only 6% of survey respondents considered themselves as infrastructure clients. The main reason is that, in Australia, many infrastructures are state owned or temporarily owned by the private sector thus, some of the clients are hidden within the contractor and government agency category.

So approximately we have decided to keep a sample of 388 for the Nagpur city.

Sampling Method:

Cluster sampling is used in statistics when **natural groups** are present in a population. The whole population is subdivided into clusters, or groups, and random samples are then collected from each group.

Cluster sampling is typically used in market research. It's used when a researcher **can't get information about the population as a whole**, but they can get information about the clusters.

Hypothesis for the study:

H01: There is no significant relationship between Total Asset Management (TAM) and risk Management.

In this hypothesis Risk Management is considered as independent variable and Total Asset Management is considered as dependent variable.

Dependent variable Total Asset Management can be measured from the responses gathered on the following statements on 5 point Likert scale (Strongly disagree, disagree, neutral, agree, and strongly agree)

TAMM is the best system for asset management of Govt. assets and TAMM has complete procedures and guidelines in Managing assets

Independent variable Risk Management can be measured from the responses gathered on the following statements on 5 point Likert scale (Strongly disagree, disagree, neutral, agree, and strongly agree)

- Design risks - Design errors and omissions, Design process takes longer than, Stakeholders request late changes and Failure to carry out the works in accordance with the contract
- External risks - New stakeholders emerge and request, Public objections, Laws and local standards change and Tax change
- Environmental risks - Environmental analysis incomplete, New alternatives required to avoid, mitigate or minimize environmental impact, Delayed deliveries and Lack of protection on a construction site
- Project management risks - Failure to comply with contractual quality requirements, Scheduling errors, contractor delays and Project team conflicts
- Right of way risks - Expired temporary construction permits and Contradictions in the construction documents
- Construction risks - Construction cost overruns and Technology changes

This hypothesis is tested using ANOVA and Cronbach's alpha test.

ANOVA- The one-way analysis of variance (ANOVA) is used to determine whether there are any statistically significant differences between the means of three or more independent (unrelated) groups. This guide will provide a brief introduction to the one-way ANOVA, including the assumptions of the test and when you should use this test.

Cronbach's alpha- It is the most common measure of internal consistency ("reliability"). It is most commonly used when you have multiple Likert questions in a survey/questionnaire that form a scale and you wish to determine if the scale is reliable.

ANOVA Table

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Design Risk	Between Groups	130.582	3	43.527	31.839	.000
	Within Groups	1058.138	385	1.367		
	Total	1188.720	386			
External risks	Between Groups	172.161	3	57.387	41.555	.000
	Within Groups	1068.898	385	1.381		
	Total	1241.059	386			
Environmental risks	Between Groups	115.879	3	38.626	26.844	.000
	Within Groups	1113.710	385	1.439		
	Total	1229.589	386			
Organizational risks	Between Groups	207.178	3	69.059	55.765	.000
	Within Groups	958.514	385	1.238		
	Total	1165.693	386			
Project management risks	Between Groups	205.636	3	68.545	52.450	.000
	Within Groups	1011.527	385	1.307		
	Total	1217.163	386			
Right of way risks	Between Groups	19.263	3	6.421	4.151	.006
	Within Groups	1197.201	385	1.547		
	Total	1216.464	386			
Construction risks	Between Groups	101.351	3	33.784	24.541	.000
	Within Groups	1065.499	385	1.377		
	Total	1166.850	386			

This is the table that shows the output of the ANOVA analysis and whether there is a statistically significant difference between our group means. We can see that the significance value is 0.000 (i.e., $p = .000$), which is below 0.05 except in case of "Right of way risks" which is 0.006 and, therefore, there is a statistically significant difference in the mean of Total Asset Management and Risk Management except in case of Right of way risks. Thus, we can reject Null hypothesis H01: There is no significant relationship between Total Asset Management (TAM) and risk Management and accept Alternate hypothesis H1: There exists significant relationship between Total Asset Management (TAM) and risk Management.

Cronbach's alpha i.e. reliability test

Cronbach's alpha (or *coefficient alpha*), developed by Lee Cronbach in 1951, is a way to measure reliability, or internal consistency of a psychometric instrument.

"Reliability" is how well a test consistently measures what it is supposed to measure. Reliability tests, like Cronbach's alpha, are most commonly used to see if questionnaires with multiple Likert scale questions are reliable. These questions are designed to measure latent variables. A latent variable is a hidden or unobservable variable, like a person's conscientiousness, neurosis or openness. These variables are notoriously difficult to actually

measure; Cronbach's alpha will tell you if the test you have designed is accurately measuring the latent variable you are interested in.

Cronbach's Alpha Formula

The formula for Cronbach's alpha is:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N - 1) \cdot \bar{c}}$$

Where:

N = the number of items,

\bar{c} = average covariance between item-pairs, and

\bar{v} = average variance.

In this case the researcher has used SPSS to calculate alpha value

A rule of thumb for interpreting alpha for dichotomous questions (i.e. questions with two possible answers) or Likert scale questions is:

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

In general, a score of more than 0.7 is considered acceptable although some authors suggest higher values of 0.90-0.95 should be the norm.

(Source: <http://www.statisticshowto.com/cronbachs-alpha-spss/>)

SPSS Statistics Output for Cronbach's Alpha of Risk Management

SPSS Statistics produces many different tables. The first important table is the **Reliability Statistics** table that provides the actual value for **Cronbach's alpha**, as shown below:

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.820	.819	7

From this, we can see that Cronbach's alpha is **0.820**, which indicates a high level of internal consistency for our scale with this specific sample.

SPSS Statistics Output for Cronbach's Alpha of Total Asset Management

SPSS Statistics produces many different tables. The first important table is the **Reliability Statistics** table that provides the actual value for **Cronbach's alpha**, as shown below:

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.731	.655	2

From this, we can see that Cronbach's alpha is **0.731**, which indicates an acceptable level of internal consistency for our scale with this specific sample.

Conclusions:

The concept of Asset Management has been acknowledged by the many companies. The best way for any fast-paced company to realize its assets is to practice a simple asset management system in the place of work. An asset management system allows companies to create their assets more effectively, which in turn increases the possibility for more growth.

Certain risk-management competences are functional later on in the process; they are not able to loosen early stage mistakes. Poorly considered and planned projects lead to suggestively higher financing costs and too often even to the incapability to organize private-sector financing and risk allocation totally. In the lack of private financing and risk sharing, budget-financed public-procurement constructions continue to undermanage risk throughout the entire life cycle of the project, leading to even higher rates of project failure and poor outcomes.

Professional risk management can not only considerably increase results in public procurement processes; it can also attract and activate additional private financing. Given the scale and scope of emerging infrastructure projects, there is a strong case for accepting risk management throughout the life cycle of individual projects and also at the portfolio level.

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